

Systematic Innovation Methodology

Research Seminar in the Module 10-202-2312
for Master Computer Science

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Omnipresence of the System Concept

The concept of a *system* plays a prominent role in computer science when it comes to database systems, software systems, hardware systems, accounting systems, access systems, etc.

In general, computer science is regarded by a majority as the

"science of the systematic representation, storage, processing and transmission of information, especially their automatic processing using digital computers" (German Wikipedia).

Also certain relevant professions such as the *system architect* are in high esteem by IT users.

Omnipresence of the System Concept

However, the significance of the concept of system extends far beyond the field of computer science – it is fundamental for all engineering sciences and as *Systems Engineering* with the ISO/IEC/IEEE-15288 standard "Systems and Software Engineering", it is also the subject of international standardisation processes.

Even more, the concept of systems also plays an important role in the description of complex natural and cultural processes – for instance in the concept of an *ecosystem*.

Omnipresence of the System Concept

While classical TRIZ focuses strongly on instrumentally feasible engineering solutions, Systems Engineering

is an interdisciplinary field of engineering and engineering management that focuses on how to design, integrate, and manage complex systems over their life cycles. At its core, systems engineering utilises systems thinking principles to organise this body of knowledge. The individual outcome of such efforts, an engineered system, can be defined as a combination of components that work in synergy to collectively perform a useful function. (English Wikipedia)

On the Notion of a System

"Utilising systems thinking" refers to a system concept that describes **the purpose-oriented interaction of viable components in a delimited context for the provision of emergent functions.**

Such functions are not inherent to any of the components, but result from their interaction within the context of a defined throughput of energy, material and information, which is provided by an – in systemic terms – "external world". See the lecture for more details.

Such approaches play a central role not only in the field of engineering, but also in the field of business processes, systems and models. Systemic approaches are linked to the concept of an **organisation** as a socio-technical system. More about this in the handout *Systems, Organisations, Management* in the github repo of this course.

TRIZ and Systematic Innovation

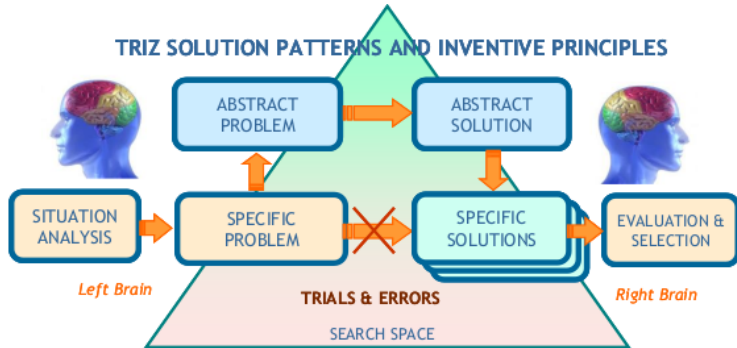
TRIZ is a Russian acronym and stands for *Theory of Innovative Problem Solving*.

TRIZ is often perceived as a complex toolbox alone. In reality, it is a problem-solving methodology with special focus on

- ▶ systemic modelling
- ▶ and solution of contradictions
- ▶ through conceptual integration into larger contexts
- ▶ and systemic development according to dialectical principles.

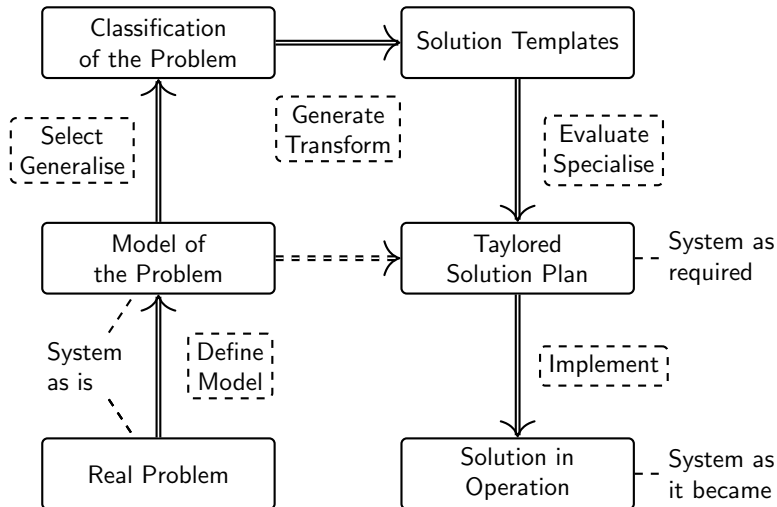
This methodology can be applied to *any planning approach*, including non-technical areas such as Business and Management.

TRIZ and Systematic Innovation



The general TRIZ solution pattern

TRIZ and Systematic Innovation



TRIZ and Systematic Innovation

TRIZ methodologies are applied

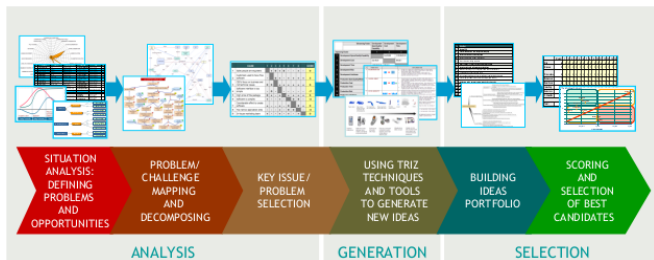
- ▶ to sharpen intended effects in functional modelling as an Ideal Final Result or Ideal Machine,
- ▶ to identify negative (harmful) effects occurring during implementation,
- ▶ to localise such problems as contradictory behaviour in a delimitable "operational zone",
- ▶ and finally to resolve such contradictions by transforming a "system as it is" into a "system as required".

Such ideas and approaches can be transferred to non-technical areas in which *systemic thinking*, *planning-based* cooperative action and thus *scientifically based practices* are established.

TRIZ and Systematic Innovation

In the last 20 years, in particular the field of *organisational management* has developed in this direction. This domain includes the modelling of *business processes* in smaller-scale internal BP landscapes and more compact *business models* in larger-scale inter-organisational contexts.

TRIZ is an experience-based *systematic* approach. *Business TRIZ* has been unfolding for about 20 years and actively promotes the transfer of experience, embedded in other management cultures and approaches.



TRIZ and Systematic Innovation

In TRIZ as an *application-oriented methodology*, "use cases" as successful solutions to problems are an important driver for the further theoretical development.

In this specificity, Business TRIZ meets with other management theories, which also have to prove their effectiveness above all in *practical* applications.

For this purpose, specific consulting structures have emerged in the management sector, in which such experiences *converge* on an inter-company level, are *systematised*, *consolidated* and *disseminated* via both consulting and training structures.

Business TRIZ is only one building block in this larger methodological context.

The Seminar

In the seminar, we want to learn more about modelling approaches of *Business TRIZ* to business processes within a company, especially with regard to contradictory requirement situations that cannot be solved by compromises, but require a dialectical resolution in the sense of the TRIZ methodology and the emergence of common conceptual and notational worlds.

The basis for student presentations are individual chapters from (Mann 2007). Based on this material, particular Business TRIZ concepts are to be presented in more detail in their relation to more general concepts of business processes, systems and models. See the file `Seminarplan.md` for details.

The Seminar

The seminar is a **research seminar** in which we jointly explore different aspects of Business TRIZ and related concepts.

With this seminar, we are approaching a topic that is new to us, which offers the opportunity to participate in a joint academic explorative process on a basis of equals.

This bears opportunities, but also challenges. The students are expected to actively participate in the seminar through seminar discussions, presentations and last but not least by reading the relevant materials.

For the successful completion of the seminar, a topic has to be presented in the seminar as discussion leader and a handout of 2–3 pages on the topic has to be submitted in advance.

The Seminar

The seminar will be held weekly on Tuesdays 9-11 a.m. synchronously online.

Prior to each appointment participants have to study the assigned reading to be in a position to discuss the problems in the seminar.

The seminar is moderated by a *discussion leader*, who prepares a short handout of 2–3 pages and makes it available to the participants in advance *before the seminar* (by Sunday evening).

The **primary source for the seminar plan** is the (actual version of the) file `Seminarplan.md` in the github repository *Seminar-S22*.

Course Structure

The course includes

- the lecture "Modelling Sustainable Systems and Semantic Web"
- the seminar "Systematic Innovation Methodology"

You find more about the seminar in the Saxonian e-learning platform OPAL <https://bildungsportal.sachsen.de/opal> in the course S22.BIS.SIM. The platform will be used for organisational purposes only.

You can access OPAL with the data of your studserv account.

Course Structure

In the **lecture** *Modelling Sustainable Systems and Semantic Web* (Thursdays 9-11 a.m.) important concepts such as

- technology as a unity of socially available procedural knowledge, institutionalised procedures and private procedural skills,
- sustainability requirements in systemic concepts,
- digital changes and concepts of semantic web technologies,
- concept and knowledge formation processes,
- cooperative action, network economies and open culture

are developed in more detail.

The lecture and the seminar are not directly related to each other, but conceptual frameworks developed in the lecture will be heavily present in the seminar.

Organisational Matters

The course can be taken for credit as Seminar Module 10-202-2312 (5 CP) "Applied Computer Science".

- **Prerequisite for examination:** Successfully completed seminar.
- **Examination:** Seminar paper.

Data protection

We follow an Open Culture approach not only theoretically but also practically and make course materials publicly available. This also applies to the course materials you have to produce (presentations, seminar papers) as well as to (annotated) chat sessions of the seminar discussions, in which your names are also mentioned. **We assume your consent to this procedure if you do not explicitly object.** The discussions themselves are not recorded.

Summary

- Lecture: Thursdays 9:15-10:45, SG 31-5
- Continuously updated lecture plan and list of references in the Lecture/README.md file in the github Repo.
- Further (mainly organisational) information also in the forum of the OPAL course.
- Seminar: Tuesdays 9:15-10:45, synchronous digital
- Seminar online in the BBB room BIS.SIM,
<https://meet.uni-leipzig.de/b/gra-w2c-fhz-qnp>

Questions ?

See also 2022-04-19/README.md for additional information about the goal of the course.